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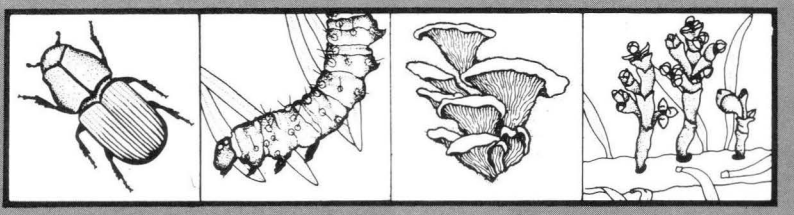

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MOUNTAIN PINE BEETLE POTENTIAL BOULDER CREEK AND WEST MOYIE ANALYSIS AREAS

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The mountain pine beetle, *Dendroctonus ponderosae* Hopkins (MPB), is the most destructive insect pest of conifers in western North America. During the past 20 years, in the Northern Region alone, an estimated 240,000,000 trees have been killed by MPB. Approximately 90 percent were lodgepole pines, the beetles' preferred host. Though populations have been declining Regionwide since 1981, when nearly 2.5 million acres were infested, almost 200,000 acres were still affected in 1990. Significant infestations remain on portions of the Kootenai and Lolo National Forests in northwest Montana (Gibson and Oakes 1989, Oakes and Gibson 1991).

A better understanding of MPB population dynamics, technological advances, access to previously inaccessible areas, and a change in overall management philosophies should prevent such extensive and intensive beetle outbreaks in the future. Still, because of the ecological relationships between MPB and their hosts, beetles will always be a management concern when lodgepole pine stands reach susceptible conditions. Those conditions have been identified as a combination of average stand diameter exceeding 8 inches, stand age greater than 80 years, and combined elevation/latitude suitable to allow beetles to complete their life cycle in 1 year (below 5,400 feet at 48 degrees north latitude) (Amman, et al., 1977).

Data, collected over the past two decades, show more than 90 percent of the trees (over 5 inches d.b.h.) may be killed in high-hazard lodgepole pine stands before an infestation runs its course. Infestation length averages 8 to 10 years. Recently, a loss prediction computer model has been developed which can help illustrate anticipated beetle-caused mortality in lodgepole pine stands of various characteristics (Cole and McGregor 1983). Several representative stands from each of the Boulder Creek and West Moyie analysis areas were selected. Stand data were subjected to analysis with the loss prediction model currently used. The following table shows predicted mortality over a 10-year infestation period in those stands:

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Predicted MPB-Caused Mortality in Lodgepole Pine Stands
Boulder Creek and West Moyie Analysis Areas

Anal. Area & Stand No.	LPP/Acre Before Infest.	LPP/Acre Killed During 10-Yr. Inf.	Green LPP/Acre Following Inf.	% LPP Killed
Boulder Creek				
746-03-45	101	30	71	30
747-01-07	409	165	244	40
747-01-08	554	76	478	14
747-01-12	367	80	287	22
West Moyie				
730-02-01	107	59	48	55
730-02-18	172	54	118	31
735-01-46	143	80	63	56
735-01-53	216	102	114	47
730-02-45	87	37	50	43

Though these are but computer projections, and actual mortality in an outbreak could vary considerably; estimates indicate the serious effect MPB can have on susceptible stands. It should also be pointed out that those figures represent trees per acre only. Because beetles kill larger diameter trees in a stand first, a tree-per-acre loss of 50-60 percent often represents 80-90 percent of the stand's merchantable volume.

Research completed and demonstrated within the past 10 years has resulted in a variety of acceptable management alternatives for lodgepole pine stands. While beetle-caused mortality may not be eliminated entirely, it can often be postponed, or reduced to more tolerable levels, through appropriate stand management (Amman 1989).

Mature, or overmature stands, predominantly lodgepole pine, should be regenerated if that is consistent with other management objectives. Mature, mixed-species stands can be commercially thinned--favoring species not susceptible to MPB. Younger stands, or stands with limited silvicultural alternatives--despite species composition--are candidates for basal area reductions or sanitation thinnings.

The recent identification of important MPB semiochemicals (message-bearing chemicals used by species of organisms to influence the behavior of the same, or in some cases different, species) has led to the development of valuable tools which can help manipulate MPB populations to our benefit (Borden, et al., 1983). Conveniently packaged, environmentally acceptable, and economical MPB "tree baits" can effectively concentrate beetle populations in already infested stands until those stands can be removed (Phero Tech 1990). Because of their effectiveness in attracting beetles, tree baits are not applicable for use where stands are to be thinned. Regeneration harvests--even small "patch cuts"--can be made more effective by concentrating, and to a lesser extent attracting, beetles into trees which will then be removed. Using tree baits in stands to be thinned, on the other hand, may result in leave trees surrounding baited trees being killed. We do issue cautions for the use of tree baits: (1) stands need to be removed within a year following baiting; and (2) baits should not be used

if there is doubt about the timely removal of the stand. Baiting a stand and then not removing it will likely only exacerbate the problem.

Demonstrations have shown the benefits of partial cutting as a means of reducing tree mortality caused by MPB (McGregor 1987). From those have come operational sanitation thinning guidelines for lodgepole pine stands threatened by the beetle (Bollenbacher and Gibson 1986). The following guides have been used successfully to reduce beetle-caused mortality from 53 percent in uncut stands to no mortality in nearby thinned ones (Gibson 1988):

1. Selected sites should be productive--ones on which crop trees will most likely respond to release.
2. Treated slopes should be 35 percent or less.
3. Average stand diameter should exceed 9 inches d.b.h..
4. Stands should be between 60 and 125 years old.
5. Stands should have an uncut basal area of at least 130 square feet per acre.
6. Stands should be lower than 6000 feet elevation.
7. Sheltered slope positions should be selected to reduce losses to windthrow.
8. MPB infestation rate should be ten percent or less at time of treatment.
9. Crop trees should have a live crown ratio of 30 percent or greater.
10. Consider only those stands where other resource objectives preclude regeneration harvests.

Both short- and long-term benefits of sanitation thinnings (basal area reductions) have been demonstrated. The immediate effect is the changing of stand conditions to ones less preferred by MPB. Such stands are warmer, brighter and have increased air movements--which seem to interfere with pheromone communication systems of the beetle (Bartos and Amman 1989). In the longer term, even older lodgepole pine stands have responded to thinning with improved growth rate. We now know trees in a more vigorous condition are both less attractive and susceptible to beetle depredations.

In summary, many lodgepole pine stands in the Boulder Creek and West Moyie analysis areas are in a "high-hazard" condition relative to MPB. Stand ages average 80-100 years. Many exceed 8 inches average stand diameter. Most are at elevations suitable for beetle development. In addition, recent examinations indicate beetle populations, though currently endemic, are present. Further, phloem thickness is generally adequate to provide ample food for beetle broods. Finally, growth rates appear to be in a general state of decline. It is not unreasonable to surmise serious epidemics are likely within the next 10 to 20 years.

Admittedly, we have not yet identified what precise combination of conditions permit beetle populations to rapidly expand from endemic to epidemic levels. Weather quite possibly plays a role in that process. Historically, many MPB outbreaks have been preceded by periods of unusually dry weather. While extreme northern Idaho has not experienced the recent period of below-normal precipitation, which has occurred in most of Idaho and Montana, such an eventuality is always possible. At any rate, the probability that a particular lodgepole pine stand will experience a significant MPB outbreak during its most susceptible period--80 to 120 years of age--is

great. At the very least, it is sufficiently high that the prudent manager will take whatever measures management objectives will allow to forestall that likelihood.

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